V. "Experiments with Pressure on Excitable Tissues." By GEORGE J. ROMANES, F.R.S. Received May 18, 1886.

The effects of temperature on excitable tissues have been well worked out; but, so far as I have been able to ascertain, no physiologist has tried the effects of pressure. From physical analogies it appeared to me probable that increase of pressure would act on excitable tissues in a manner analogous to decrease of temperature, and conversely; but the results of my experiments have not borne out this anticipation. Nevertheless, the research seems worth publishing.

In a small glass chamber, made for the purpose, I was able to place the freshly excised heart of a frog or a tortoise, and there to submit the rhythmically beating tissue to any increase of atmospheric pressure that I desired, up to a maximum limit of twenty-two atmospheres, beyond which it was not safe to go with the glass chamber that I had. Through one end of this chamber two platinum electrodes were admitted, by means of which I was able to stimulate the nerve of a nerve-muscle preparation, when this, instead of a heart, was placed in the chamber.

The result of a number of experiments was to show that neither the rhythm of the beating heart nor the excitability of the motor nerve was in any way affected by an increase of twenty-two atmospheres; for both the rhythm and the excitability remained the same whether the chamber was exhausted by means of an air-pump or filled with air at a pressure of twenty-two atmospheres. In these experiments the excitability of the nerve was tested from time to time by noting the distance from the primary coil to which the secondary coil of an ordinary du Bois induction apparatus had to be drawn in order to yield a minimal stimulation; and the rhythm of the heart was counted by watching it through the glass. In some of the experiments the pressure was let in gradually, in others suddenly; in some it was let in and again released a number of times in rapid succession; while in others it was allowed to remain at twenty-two atmospheres without alteration for half an hour. During these long exposures the rhythm of the heart and the excitability of the nerve would sometimes slightly and continuously fall; but it did not appear to me that this was due to the pressure, since the diminution of excitability in either case was not any greater than that which is often observable in moist chambers at ordinary pressures.

Wishing to try whether still higher pressures would produce any effects, I discarded the glass chamber and had one made for me of gun-metal. With this I was able to go up to 150 atmospheres, but was not able to see what was going on inside. My method of

experimenting here, therefore, was to take the rhythm of the heart, or the excitability of the nerve, immediately before screwing up the apparatus, and again immediately after taking it down. I was thus unable to observe the effects of the pressure during the time that it was being actually applied; but as it only took me a quarter of a minute to unship the chamber and turn its contents out on the table, if the 150 atmospheres had exerted any marked influence on the excitability of the tissues, it would probably have been easily detected by this method. Yet neither the heart nor the nerve showed any change after an exposure of five minutes to this great increase of pressure.

VI. "The Influence of Stress and Strain on the Physical Properties of Matter. Part I. Elasticity—*continued.* The Effect of Magnetisation on the Elasticity and the Internal Friction of Metals." By HERBERT TOMLINSON, B.A. Communicated by Professor W. GRYLLS ADAMS, M.A., F.R.S. Received May 18, 1886.

(Abstract.)

The principal object of this investigation was to test the soundness of the view advanced by Professor G. Wiedemann respecting the cause of the internal friction of a torsionally oscillating wire.* According to this view the internal friction is mainly due to permanent rotation to-and-fro of the molecules about their axes; it seemed probable, therefore, that experiments on the effects of magnetising a wire either longitudinally with a helix or circularly by passing a current through it would aid in elucidating the matter.

In the experiments on the effects of longitudinal magnetisation arrangements were made so that the heat generated in the magnetising helix should not reach the wire, whilst the effect of the heat generated in the wire when an electric current was passed through it was eliminated in a manner which is fully described in the paper.

Besides the experiments on the effect of magnetisation on the internal friction and on the torsional elasticity of metals, others were made relating to the longitudinal elasticity of metals. The following are the principal results which have been obtained:—

1. When the deformations produced by the oscillations are small, the internal friction of a torsionally vibrating wire of iron or steel is not affected by sustained longitudinal magnetisation of moderate amount. The internal friction is also not affected by the sustained magnetisation even when the latter is carried to the point of satura-

* "Wiedemann's Annalen," N.F., Bd. vi, p. 485.